



Guide for



## Solar Energy Systems Engineers in California

**May also be called:** Alternative Energy Engineers; Electrical Engineers; Photovoltaic (PV) Design Engineers; PV Engineers; Solar Array Engineers; Solar Design Engineers; Solar Energy Engineers; Solar Power Engineers; Solar Project Engineers; Solar PV Systems Design Engineers

### What Would I Do?

The process of using the sun as an energy source has greatly improved over the past few decades. However, society only uses a fraction of the sun's potential energy. Solar Energy Systems Engineers are developing systems to collect and deliver renewable energy with competitive prices to today's carbon-based sources. Engineers work on various projects testing and designing new technology for solar power systems. They perform engineering evaluations of energy efficient solar projects involving residential, commercial, industrial, and utility customers. They develop products, such as solar panels, that use photovoltaic (PV) cells to convert sunlight into electricity, and solar thermal systems that use the sun to heat water and produce steam to power turbines for electricity.

Solar Energy Systems Engineers apply their knowledge of structural energy requirements, local climates, and thermodynamics to solar projects. They perform resource assessments, feasibility studies, project proposal evaluations, as well as performance and cost estimates. New and existing structures use solar for space heating systems and as a power source. Solar power generating facilities are also increasingly building standalone PV systems.

Solar Energy Systems Engineers may also give presentations on the technology, business, and risk analyses for research and design of solar products or advancements in the industry. They usually work with teams to perform experiments and analyses, construct prototypes, and demonstrate systems during the development of renewable energy technology. In addition to experimental design, some Engineers will help in the operation and maintenance of the systems in solar energy plants and businesses.

### Tools and Technology

Solar Energy Systems Engineers work with specialized software systems including computer-aided design (CAD), spreadsheet, word processing, project management, and PV energy prediction or PV energy modeling. They should also have fundamental knowledge of alternate current (AC) power theory and the related tools and materials for such systems as well as supervisory control and data acquisition (SCADA) systems. Additional tools include spectrometers, coulometers, ageing ovens, and semiconductor process systems.

### Important Tasks and Related Skills

Each task is matched to a sample skill required to carry out the task.

<i><b>Task</b></i>	<i><b>Skill Used in this Task</b></i>
Conduct engineering site audits to collect structural, electrical, and related site information for use in the design of residential or commercial solar power systems.	Quality Control Analysis
Design or coordinate design of photovoltaic (PV) or solar thermal systems, including system components, for residential and commercial buildings.	Technology Design
Create checklists for review or inspection of completed solar installation projects.	Building and Construction
Create electrical single-line diagrams, panel schedules, or connection diagrams for solar electric systems using computer-aided design (CAD) software.	Visualization
Create plans for solar energy system development, monitoring, and evaluation activities.	Monitoring
Develop design specifications and functional requirements for residential, commercial, industrial, or utility solar energy systems or components.	Judgment and Decision Making
Perform computer simulation of solar photovoltaic (PV) generation system performance or energy production to optimize efficiency.	Systems Analysis
Provide technical direction or support to installation teams during installation, start-up, testing, system commissioning, or performance monitoring.	Troubleshooting
Design or develop vacuum tube collector systems for solar applications.	Mechanical
Develop standard operation procedures and quality or safety standards for solar installation work.	Public Safety and Security
Perform thermal, stress, or cost reduction analyses for solar systems.	Production and Processing
Review specifications and recommend engineering or manufacturing changes to achieve solar design objectives.	Operations Monitoring
Test or evaluate photovoltaic (PV) cells or modules.	Systems Evaluation

Source: U.S. Department of Labor [Occupational Information Network \(O\\*NET\)](https://online.onetcenter.org) at [online.onetcenter.org](https://online.onetcenter.org)

### Working Conditions

Solar Energy Systems Engineers split their time between the office environment and on job site of specific solar projects. When on site, Engineers may experience hot, cold, and otherwise adverse environmental conditions. To ensure safety, they are required to use proper safety equipment and protocols. Most Engineers work a standard 40-hour week, but can expect occasional evening,

weekend, and holiday work to meet pressing needs. Solar Energy Systems Engineers may also travel extensively due to a shortage of experienced Engineers.

Solar Energy Systems Engineers may become members of such unions as the Professional Engineers in California Government (PECG).

### ***Will This Job Fit Me?***

The job of Solar Energy Systems Engineer may appeal to those who enjoy working with ideas that require an extensive amount of thinking. They search for facts using a variety of sources in order to solve complex engineering problems while working independently or as part of a team.

### ***What Wages and Benefits Can I Expect?***

#### **Wages**

A formal salary survey is not available; however, references to annual salaries range from \$87,000 to \$125,000. All salaries depend on the pay structure established by each employer for work performed, the nature of the project, and the level of skill required.

#### **Benefits**

Benefits that Solar Energy Systems Engineers typically receive include medical, dental, vision, and life insurance, sick leave, vacation, holidays, retirement and 401(k) plans, and potential annual bonuses.

### ***What is the Job Outlook?***

As this is an emerging occupation, the number of Solar Energy Systems Engineers in California is unknown at this time. Employment opportunities should increase in the future considering society's growing interest in environmental protection and the development of alternative energy sources.

### ***How Do I Qualify?***

#### **Education, Training, and Other Requirements**

Solar Energy Systems Engineers come from a wide variety of academic backgrounds. The minimum education requirement is a bachelor's degree in engineering or a related field of study. Most Solar Energy Systems Engineers have a degree in one of the following areas: aeronautical, civil, electrical, and mechanical engineering, as well as chemistry, computer science, or physics. They may then add a concentration in solar energy to be more marketable in the job field. Some Engineers continue their education by obtaining a master's or doctoral degree.

#### **Experience**

Employers generally require applicants to possess 2 to 10 years of work experience in order to be considered for a position. This is due to the varying nature and complexity of projects throughout the field.

#### **Early Career Planning**

High school students planning to become Solar Energy Systems Engineers should take classes in English, chemistry, mathematics, biological and life sciences, computer science or CAD programs, and mechanical drawing.

#### **Continuing Education**

While continuing education is not a requirement, most Solar Energy Systems Engineers need to update their knowledge through workshops, seminars, and ongoing training. They also need to keep up with changes to environmental codes and regulations.

#### **Licensing**

Although a Professional Engineer's (PE) license is not required for most Solar Energy Systems Engineers, a licensed Engineer will have a competitive edge for advancement to more responsible positions.

To obtain a PE license, Engineers must first pass the Engineer-in-Training or Fundamentals of Engineering examination which requires at least three years of coursework from a college or university offering an engineering program accredited by the Accreditation Board for Engineering and Technology (ABET), or three years of engineering-related experience. The next step in the process is to pass the professional examination which requires a bachelor's degree in engineering from an ABET-accredited institution, along with two years of eligible engineering experience. Engineers without a bachelor's degree in engineering must possess six years of eligible experience. The license must be renewed every two years. Contact the agency that issues the license for additional information.

### **Where Can I Find Training?**

There are two ways to search for training information at [www.labormarketinfo.edd.ca.gov/?Pageid=1013](http://www.labormarketinfo.edd.ca.gov/?Pageid=1013):

- [Search by Field of Study](#) to find what programs are available and what schools offer those programs. You may use keywords such as: ABET, Energy, Engineer, and Solar.
- [Search by Training Provider](#) to find schools by name, type of school, or location.

Contact the schools you are interested in to learn about the classes available, tuition and fees, and any prerequisite course work.

### **Where Would I Work?**

According to the 2009 *California Green Economy Survey*, Solar Energy Systems Engineers were surveyed under the broader field of Alternative Energy Engineers. Results indicate they largely work in research and development firms as well as the following industries: Engineering and Consulting Services, Specialty Trade Contractors, Educational Services, and Utilities.

### **Finding a Job**

Direct application to employers remains one of the most effective job search methods. Solar Energy Systems Engineers can also register with their school placement center for job leads. Professional associations and organizations provide job leads as well. **Online job opening systems** include JobCentral at [www.jobcentral.com](http://www.jobcentral.com) and CalJOBS<sup>SM</sup> at [www.caljobs.ca.gov](http://www.caljobs.ca.gov).

To find your nearest One-Stop Career Center, go to [Service Locator](http://www.servicelocator.org) at [www.servicelocator.org](http://www.servicelocator.org). View the [helpful job search tips](http://www.labormarketinfo.edd.ca.gov/occguides/JobSearchTips.pdf) at [www.labormarketinfo.edd.ca.gov/occguides/JobSearchTips.pdf](http://www.labormarketinfo.edd.ca.gov/occguides/JobSearchTips.pdf) for more resources. (requires [Adobe Reader](#)).

### **Yellow Page Headings**

You can focus your local job search by checking employers listed online or in your local telephone directory. Below are some suggested headings where you might find employers of Solar Energy Systems Engineers.

- Alternative Power
- Environmental Compliance
- Green Energy
- Solar Energy
- Solar Panels

### **Find Possible Employers**

To locate a list of employers in your area, use "Find Employers" on the LaborMarketInfo Web site at [www.labormarketinfo.edd.ca.gov/aspdotnet/databrowsing/empMain.aspx?menuChoice=emp](http://www.labormarketinfo.edd.ca.gov/aspdotnet/databrowsing/empMain.aspx?menuChoice=emp)

- Select the search for employers by occupation.

- Select a geographic area.
- Search for an occupation by keyword, occupation, or category.
- Select one of the top industries that employ the occupation.
- This will give you a list of employers in that industry in your area.
- Click on “View Filter Selections” to limit your list to specific cities or employer size.
- Click on an employer for the street address, telephone number, size of business, Web site, etc.
- Contact the employer for possible employment.

### ***Where Could This Job Lead?***

After years of experience working for private firms or government agencies, Solar Energy Systems Engineers sometimes join consulting firms or start their own businesses. They may also take on additional responsibilities and work on more complex projects as means for advancement.

### ***Related Occupations***

Below is a list of occupations related to Solar Energy Systems Engineers.

- Biomass Engineers
- Chemical Engineers (SOC 17-2041)
- Civil Engineers (SOC 17-2051)
- Geothermal Engineers
- Electrical Engineers (SOC 17-2071)
- Mechanical Engineers (SOC 17-2141)
- Wind Energy Engineers (SOC 17-2199)

### ***Other Sources***

- California Board for Professional Engineers, Land Surveyors, and Geologists  
[www.pels.ca.gov](http://www.pels.ca.gov)
- California Department of Consumer Affairs  
[www.dca.ca.gov](http://www.dca.ca.gov)
- California Energy Commission  
[www.energy.ca.gov](http://www.energy.ca.gov)
- California Environmental Protection Agency  
[www.calepa.ca.gov](http://www.calepa.ca.gov)
- California Society of Professional Engineers  
[www.cspe.com](http://www.cspe.com)
- U.S. Department of Energy, Energy Efficiency & Renewable Energy  
[www.eere.energy.gov](http://www.eere.energy.gov)
- Accreditation Board for Engineering and Technology  
[www.abet.org](http://www.abet.org)
- American Society for Engineering Education  
[www.asee.org](http://www.asee.org)
- Institute of Electrical and Electronics Engineers  
[www.ieee.org](http://www.ieee.org)
- Junior Engineering Technical Society  
[www.jets.org](http://www.jets.org)
- National Society of Professional Engineers  
[www.nspe.org](http://www.nspe.org)
- Professional Engineers in California Government  
[www.pecg.org](http://www.pecg.org)

These links are provided for your convenience and do not constitute an endorsement by EDD.

### ***For the Career Professional***

The following codes are provided to assist counselors, job placement workers, or other career professionals.

System	Code
SOC – <a href="http://www.bls.gov/soc">Standard Occupational Classification</a> at <a href="http://www.bls.gov/soc">www.bls.gov/soc</a>	N/A
O*NET – <a href="http://online.onetcenter.org">Occupational Information Network</a> at <a href="http://online.onetcenter.org">online.onetcenter.org</a>	17-2199.11

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